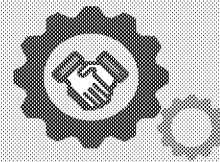


# Team App Building Workshop

Oct 25 - 26, 2016

Washington, DC

## Data Viz EPA & CDC



### Members:

Michael Firestone ,  
David G. Smith,  
Shannon Dewitt,  
Paul-Harvey Weiner ,  
Patti Nelson &  
Sala Senkayi



# Historical Water/Air Data!

- *The earliest samples on the Mississippi were collected by Captain Talcott of the US Army in 1838 but no record is kept of the sampling method used.*

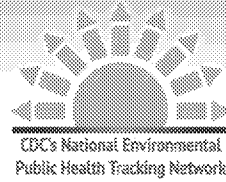
## **History of Fluvial Hydraulics**

By R. J. Garde

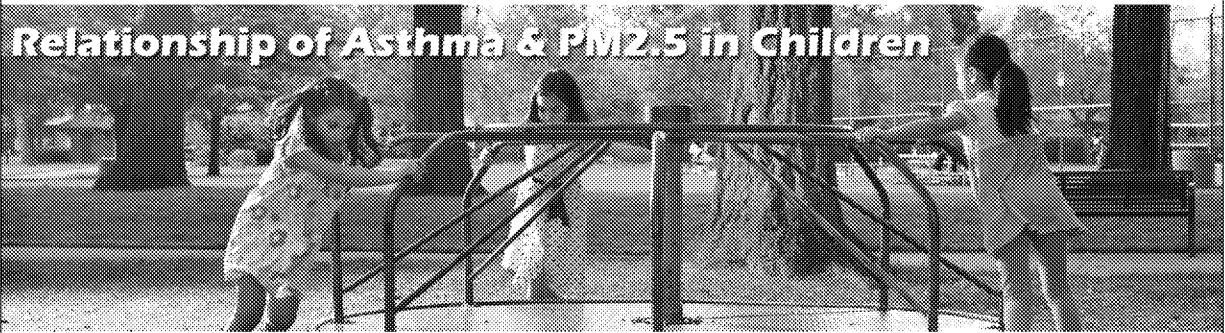
- *Asthma cost the US \$56 billion in 2007. Additionally, air pollution is the leading environmental threat to human health, according to the CDC.*

Combining these data allows decision makers to appreciate connections between multi-dimensional data sets and provides novel ways to interpret data through the use of new, innovative data visualization tools such as Qlik!

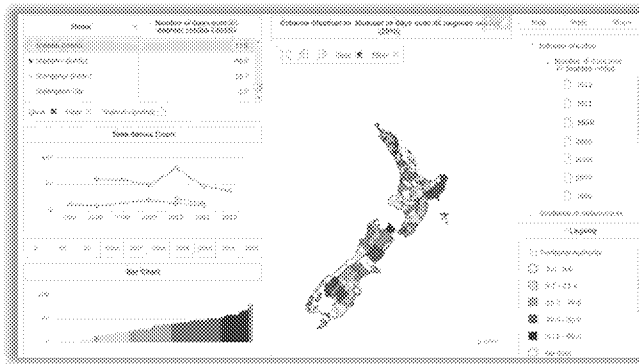
## Data Visualization Tool Using EPA & CDC Data



### Relationship of Asthma & PM<sub>2.5</sub> in Children

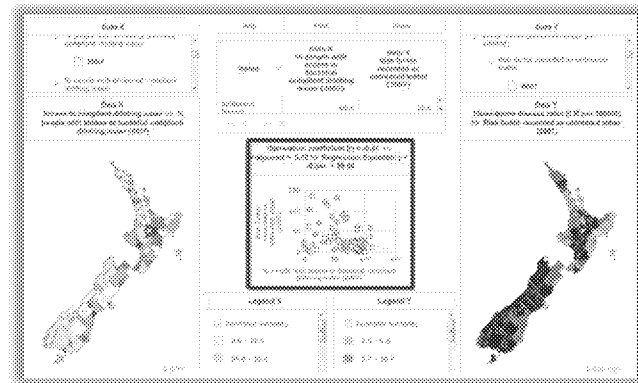


# Background & Project Importance

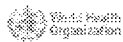


← Option # 1-One Area

→ Option #2- Two Areas



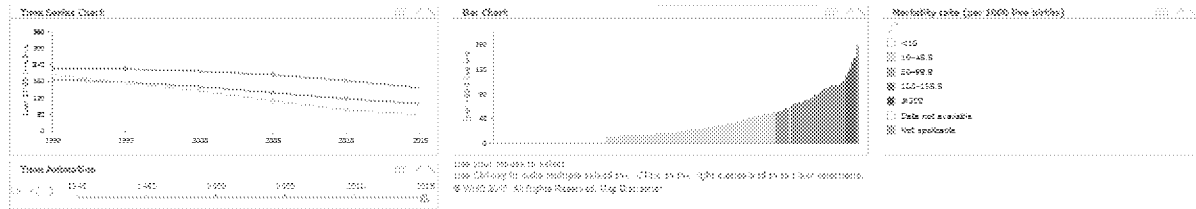
# Background & Project Importance



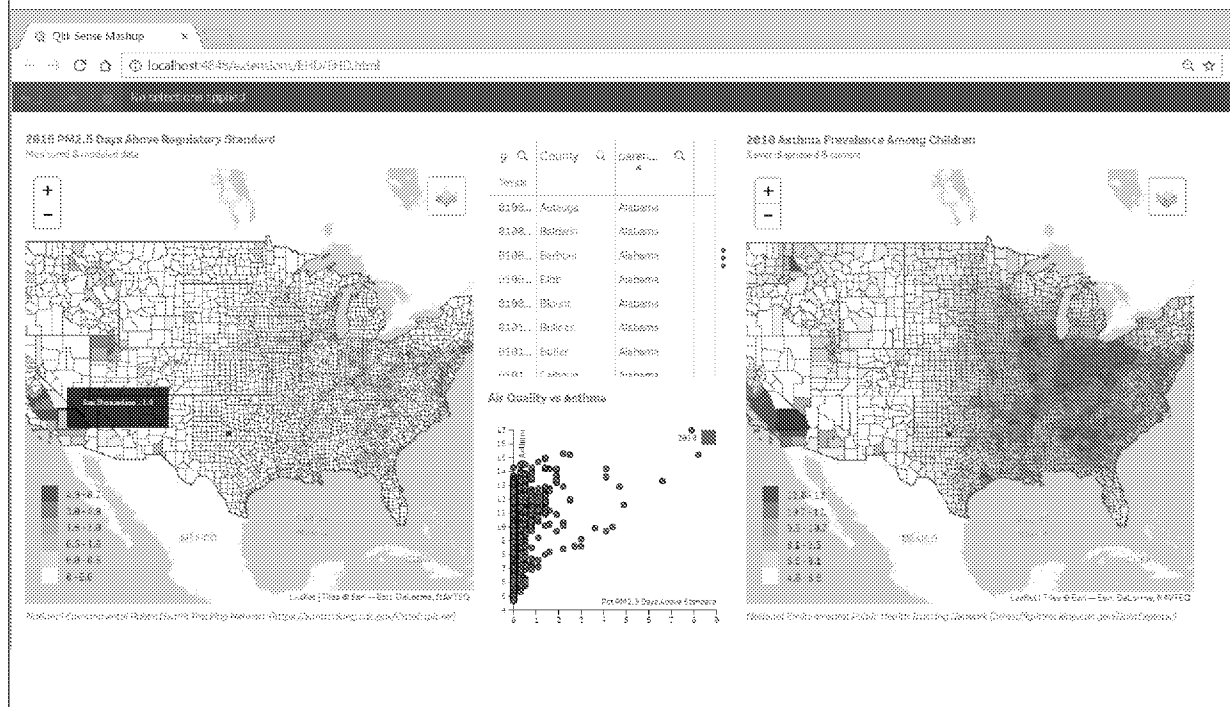
MINDA Child mortality, 1990-2015  
Under-five mortality rate (probability of dying by age 5 per per 1000 live births), 2015



Sources: UNICEF, WHO, World Bank, UN DESA/Population Division, Levels and Trends in Child Mortality 2015, UNICEF, 2015.



# Current App Progress...



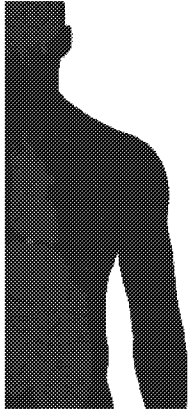
Notice without the data being displayed in the same form, it's hard noting similarities!

# Asthma in the US

Growing every year via...

May 2011

<sup>CDC</sup>  
*Vitalsigns*<sup>™</sup>



1 in 12

About 1 in 12 people (about 25 million) have asthma, and the numbers are increasing every year.



12M

About 1 in 2 people (about 12 million) with asthma had an asthma attack in 2008, but many asthma attacks could have been prevented.



56 Billion

Asthma cost the US about \$56 billion in medical costs, lost school and work days, and early deaths in 2007.

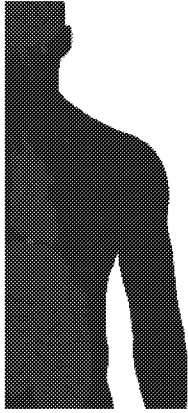
**More than half (53%) of people with asthma had an asthma attack in 2008.  
More children (57%) than adults (51%) had an attack.**

# Asthma in the US

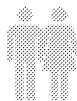
## Amazing Facts!!!

May 2011

<sup>CDC</sup>  
*Vitalsigns™*



Asthma is a lifelong disease that causes wheezing, breathlessness, chest tightness, and coughing. It can limit a person's quality of life. While we don't know why asthma rates are rising, we do know that most people with asthma control it.



The number of people diagnosed with asthma **grew by 4.3 million from 2001 to 2009**. From 2001 through 2009 asthma rates rose the most among black children, almost a 50% increase. Asthma was linked to **3,447 deaths (about 9 per day) in 2007**.



Asthma costs in the US grew from about \$53 billion in 2002 to about \$56 billion in 2007, about a 6% increase.



# Asthma in the US

## CDC Success Stories-NY/MD...

May 2011

<sup>CDC</sup>  
*Vitalsigns™*

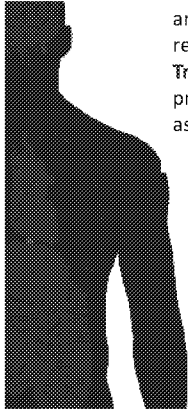
### What did Tracking do in NY?

Each fall NYC sees a large increase in hospital stays and in emergency department visits for asthma, especially among children. **Illness rates in the fall can be three times higher than rates during the summer.** Possible reasons include infections among children returning to school, seasonal pollen, and cooler weather. **The NYC Tracking Program analyzed childhood asthma data.** It used the results to write messages for health care providers. The messages—sent through the city's Health Alert Network—urged providers to update patients' asthma management plans in time for school year start.

### What did Tracking do in MD?

The Maryland Tracking Program used asthma emergency room visit and hospital discharge data from the health department and air data from the MDE and the Environmental Protection Agency (EPA) to carry out an EPA- funded project, to examine the relationship between asthma rates and fine particulate levels in and around Baltimore. **On bad air quality days, hospital visits increased!**

**Improved public health in these and in many other examples, thus CDC's participation in the App Development workshop!**



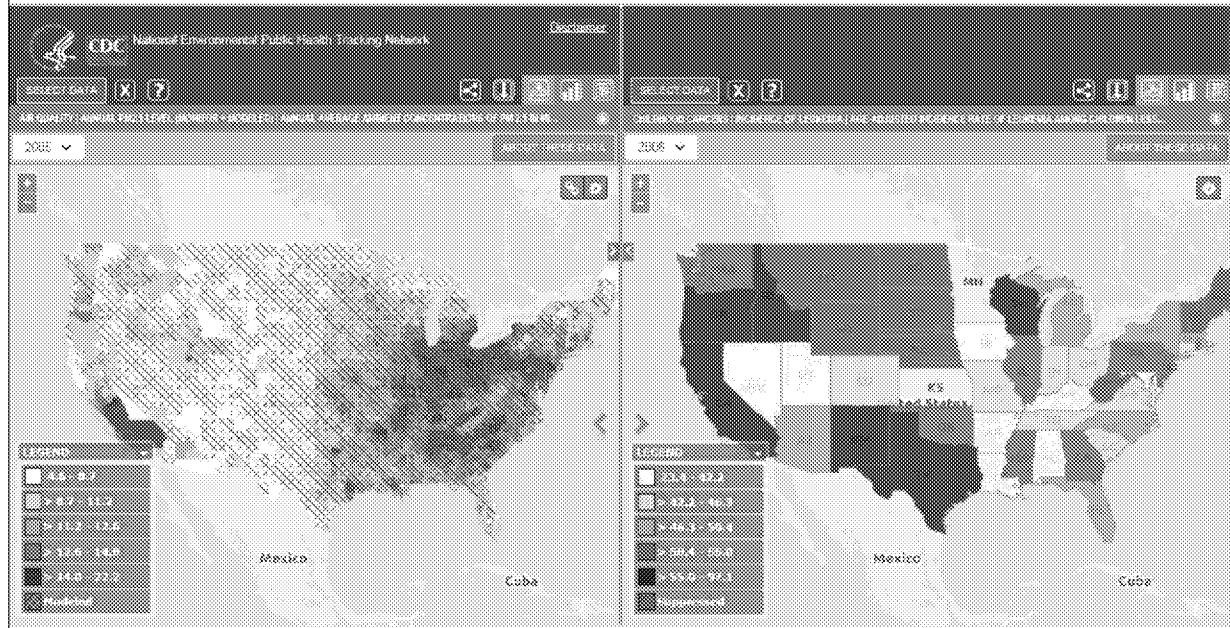
# Common Mapping Examples...



Notice without the data being displayed in the same form, it's hard noting similarities!

# Childhood Cancer/PM2.5 – Further Analysis!

- Left map - ANNUAL PM2.5 LEVEL,
- Right map - INCIDENCE OF LEUKEMIA (CHILDHOOD)



Other interesting datasets...

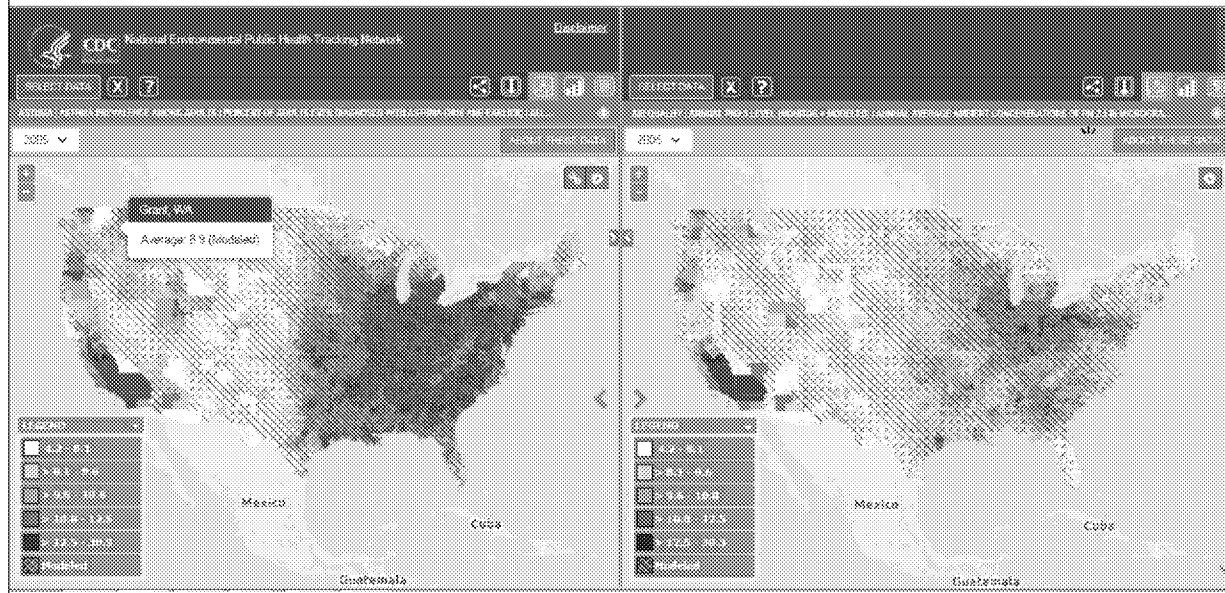
Left --- AIR QUALITY | ANNUAL PM2.5 LEVEL (MONITOR + MODELED) | ANNUAL AVERAGE AMBIENT CONCENTRATIONS OF PM 2.5 IN MICROGRAMS PER CUBIC METER, BASED ON SEASONAL AVERAGES AND DAILY MEASUREMENT (MONITOR AND MODELED DATA) | ALL COUNTIES

Right --- CHILDHOOD CANCERS | INCIDENCE OF LEUKEMIA | AGE-ADJUSTED INCIDENCE RATE OF LEUKEMIA AMONG CHILDREN LESS THAN 15 YEARS OF AGE PER 1,000,000 POPULATION | ALL STATES

# Adult Asthma/PM2.5 – A good match!

→Left map - Adult Asthma

→Right map - PM2.5 Monitor + Modeled - 2005



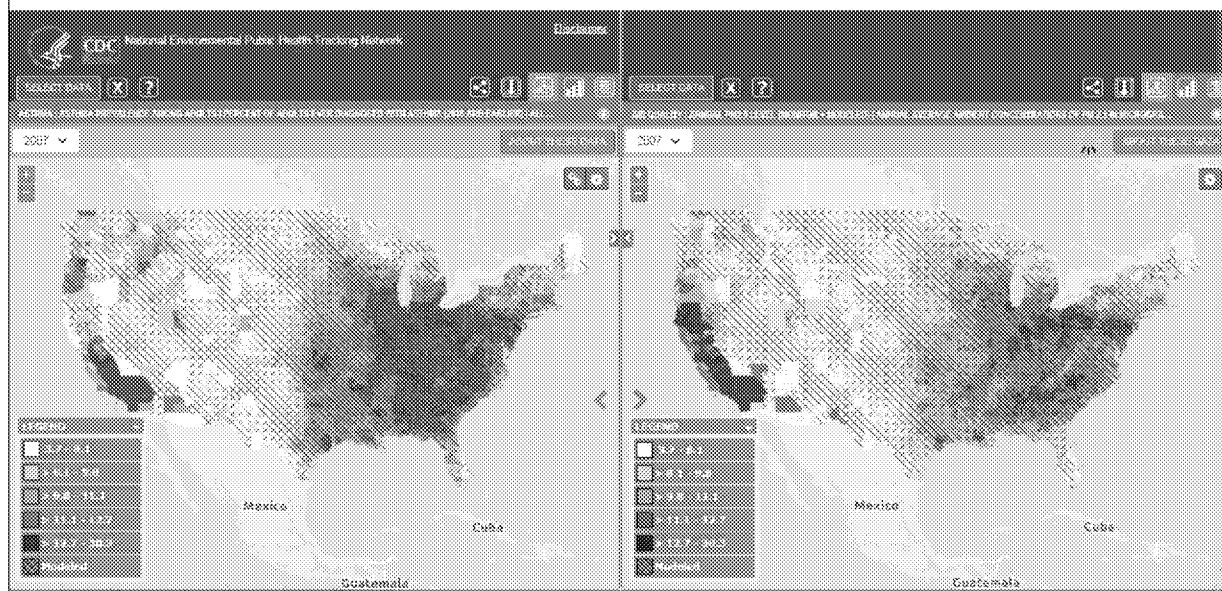
Note similarities...

Adult Asthma/PM2.5 Monitor + Modeled (we use this instead of just monitored because all the data has been interpolated by CDC). These are for 2005 & 2007.

# Adult Asthma/PM2.5 – A good match!

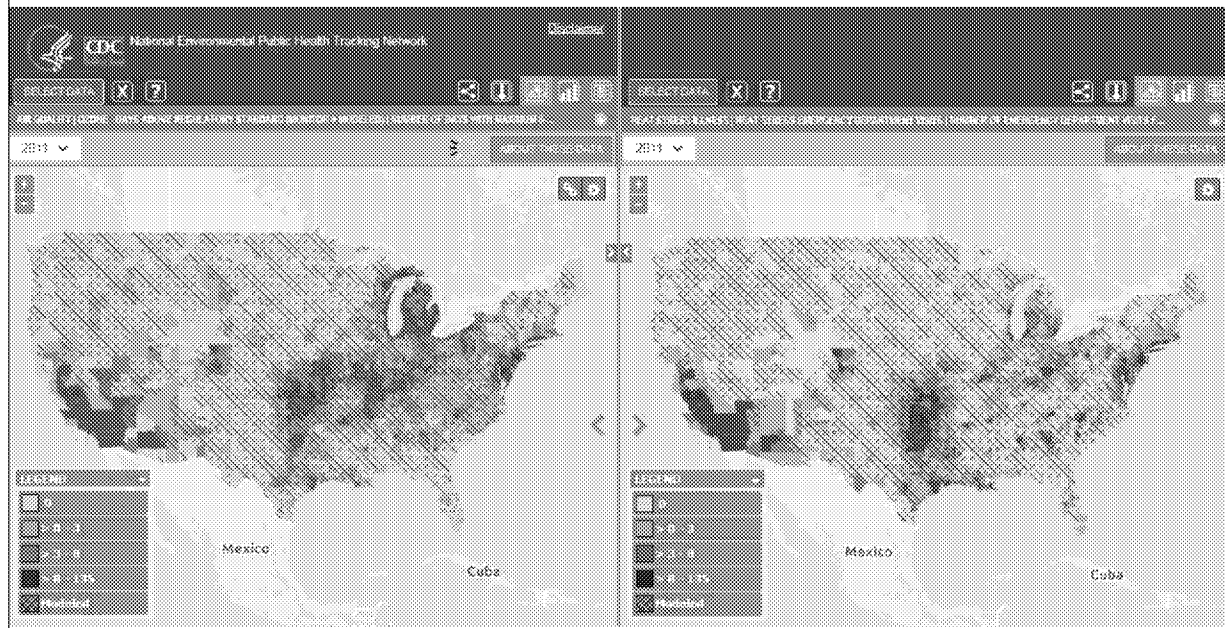
→Left map - Adult Asthma

→Right map - PM2.5 Monitor + Modeled - 2007



# Ozone/Heat Stress – A good match!

- Left map - OZONE DAYS ABOVE REGULATORY STANDARD,
- Right map - HEAT STRESS # OF EMERGENCY DEPARTMENT VISITS



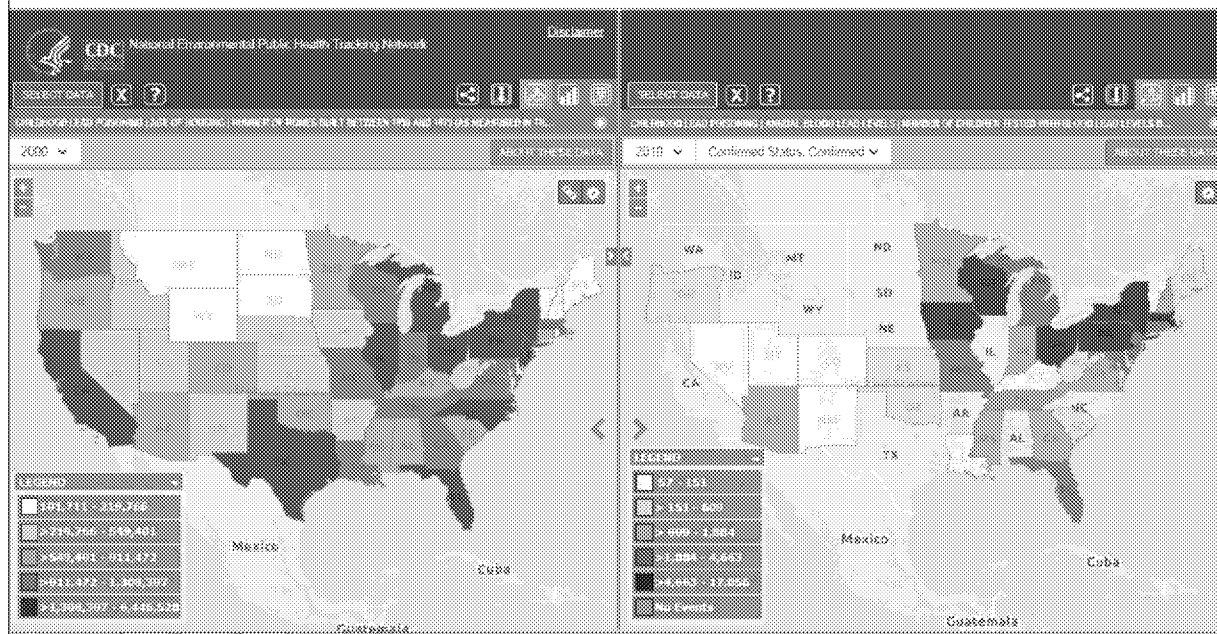
Note similarities...

AIR QUALITY | OZONE - DAYS ABOVE REGULATORY STANDARD (MONITOR + MODELED) | NUMBER OF DAYS WITH MAXIMUM 8-HOUR AVERAGE OZONE CONCENTRATION OVER THE NATIONAL AMBIENT AIR QUALITY STANDARD (MONITOR AND MODELED DATA) | ALL COUNTIES

HEAT STRESS ILLNESS | HEAT STRESS EMERGENCY DEPARTMENT VISITS | NUMBER OF EMERGENCY DEPARTMENT VISITS FOR HEAT STRESS | ALL STATES

# Childhood Blood Lead/Homes – Interesting!

- Left map - AGE OF HOUSING (1950-1979),
- Right map - CHILDHOOD ANNUAL BLL



Other interesting datasets...

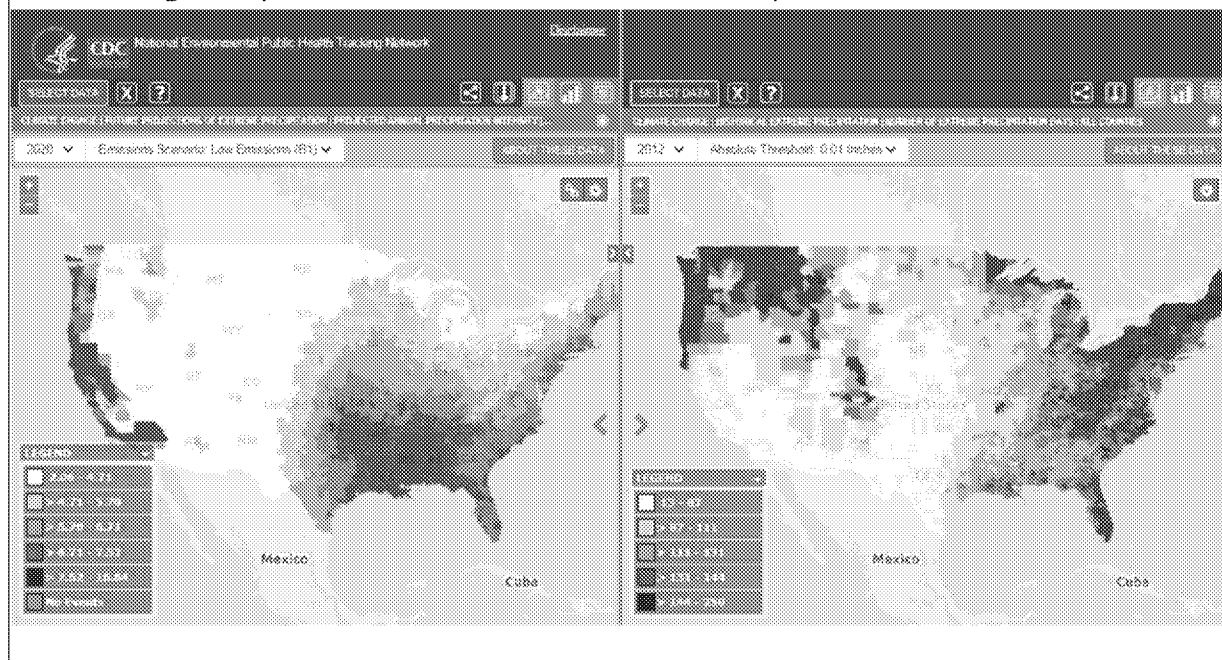
Left --- CHILDHOOD LEAD POISONING | AGE OF HOUSING | NUMBER OF HOMES BUILT BETWEEN 1950 AND 1979 (AS MEASURED IN THE 2000 CENSUS) | ALL STATES

Right --- CHILDHOOD LEAD POISONING | ANNUAL BLOOD LEAD LEVELS | NUMBER OF CHILDREN TESTED WITH BLOOD LEAD LEVELS BETWEEN 5 AND LESS THAN 10 µg/DL | ALL STATES

# Precipitation...

→ Left map - Future Predicted extreme Precipitation

→ Right map - Historical Predicted extreme Precipitation



Other interesting datasets...

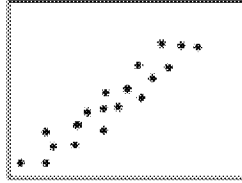
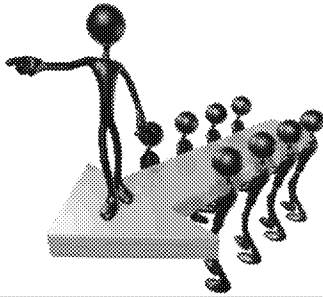
Left --- CHILDHOOD LEAD POISONING | AGE OF HOUSING | NUMBER OF HOMES BUILT BETWEEN 1950 AND 1979 (AS MEASURED IN THE 2000 CENSUS) | ALL STATES

Right --- CHILDHOOD LEAD POISONING | ANNUAL BLOOD LEAD LEVELS | NUMBER OF CHILDREN TESTED WITH BLOOD LEAD LEVELS BETWEEN 5 AND LESS THAN 10  $\mu\text{G/DL}$  | ALL STATES



## Scatterplot Trends & Relationships

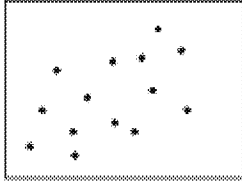
Note Strength  
and Direction



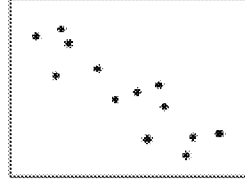
**Strong Positive**



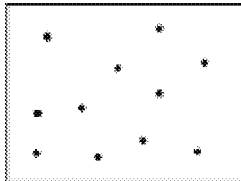
**Strong Negative**



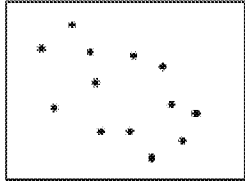
**Weak Positive**



**Moderate Negative**



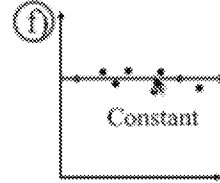
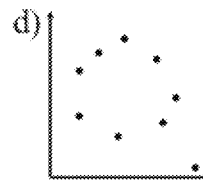
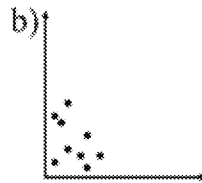
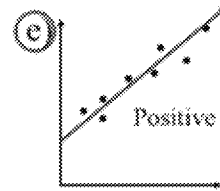
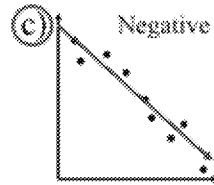
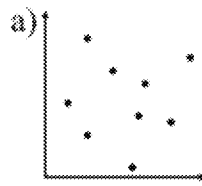
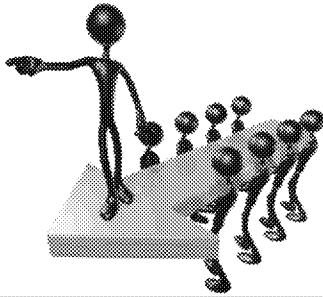
**None**



**Weak Negative**

# Scatterplot Trends & Relationships

Note Strength  
and Direction

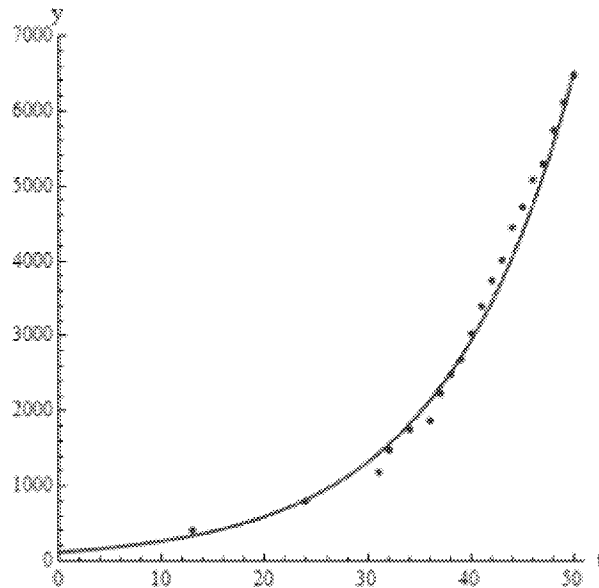


## Scatterplot Trends & Relationships

# Exponential Relationship

## Return of the Bald Eagle Example

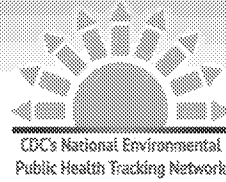
Year	t = years after 1950	Eagle Pairs
1963	13	417
1974	24	791
1981	31	1188
1982	32	1480
1984	34	1757
1986	36	1875
1987	37	2238
1988	38	2475
1989	39	2680
1990	40	3035
1991	41	3399
1992	42	3749
1993	43	4015
1994	44	4449
1995	45	4712
1996	46	5094
1997	47	5295
1998	48	5748
1999	49	6104
2000	50	6471



During the mid-20th century, the population of bald eagles in the lower 48 states declined substantially. A highly toxic pesticide, DDT, was the main cause of the decline. DDT causes damage to bird egg shells. By 1963, bald eagles were in danger of complete extinction. Only 417 pairs of bald eagles remained. In 1967, the bald eagle became an official endangered species. Then in 1972, the EPA banned the use of DDT in the United States. The impact of the ban was a dramatic turnaround in the fate of the bald eagle.

Here is the data. Note that in the table, we defined  $t$ , our explanatory variable, to be Years after 1950. The response variable is the number of bald eagle pairs that are mating.

## Data Visualization Tool Using EPA & CDC Data



## Demo & Future Projects!

1. WHO Viz App [http://gamapserver.who.int/gho/interactive\\_charts/MDG4/atlas.html](http://gamapserver.who.int/gho/interactive_charts/MDG4/atlas.html)
2. Monitoring New Zealand's Environmental Health main webpage: <http://www.ehinz.ac.nz/>
3. App (EDH): [https://edap.epa.gov/public/extensions/Env\\_HealthViz3/Env\\_HealthViz3.html](https://edap.epa.gov/public/extensions/Env_HealthViz3/Env_HealthViz3.html)
4. App (Air): <https://qlkviz.epa.gov/hub/my/work> \*\*\* NEW\*\*\*
5. CDC: <https://ephtracking.cdc.gov/DataExplorer/>
6. CDC measures: [https://ephtracking.cdc.gov/docs/API\\_Measure\\_Guide.pdf](https://ephtracking.cdc.gov/docs/API_Measure_Guide.pdf)